

Installing FreeBSD 5.3

ITOS Edition

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1 Overview

This is a recipe for installing FreeBSD 5.3 from the FreeBSD Mall CDROM. See <http://www.bsdmall.com/> to obtain the FreeBSD CD.

This recipe is optimized for PCs that will run the ITOS.

Since each PC is a little bit different, you might have to tweak this recipe a little to get it to work on your particular machine. It should be close on all machines, though.

2 Hardware Considerations

At today's prices, you can get a workstation quality PC for under \$3000. We're talking Pentium-III, SCSI, 21-inch monitor; top-notch components throughout.

Some things to consider:

1. Check the type of ethernet and graphics card used. Ensure, via the RedHat Hardware compatibility site, the cards are supported. Download any drivers if available.
2. Should the ethernet capability be internal to the motherboard, Beware; you may need to physically unplug the machine to re- initialize the network interface.
3. Get a high-quality 21 inch monitor and a mainstream video card. If price is an issue, sacrifice something else. Don't go smaller than 17-inch – ITOS assumes at least 1152x864 resolution; you can't see that many pixels on a smaller monitor.
4. Get lots of RAM. 64MB is a good minimum; you'll feel the difference between 64MB and 128MB.
5. Get a SCSI controller. You don't have to get SCSI disks (IDE wins on price/performance) but it's nice to be able to attach an external tape drive or CD burner!
6. Don't worry about the CPU. ITOS runs fine on a Pentium 133 – anything you can buy today is faster.

3 Preparing to Install

Answer these questions before starting the install:

1. How big is your hard disk?
2. Will FreeBSD be the only operating system, or will you also install Windows or other OS's?
3. If you plan to install other OS's, will you have at least 1500MB for FreeBSD?
4. Do you have an IDE disk?
5. If you have an IDE disk, what is its LBA geometry?
6. What kind of video adapter do you have?
7. What kind of monitor do you have?
8. What are the monitor's horizontal and vertical sync rates?
9. Is the CMOS clock set to UTC or local time?
10. What is this machine's IP name?
11. IP address?
12. Subnet mask?
13. Default gateway?
14. Primary nameserver?
15. Will this be an NIS client?
16. If this will be an NIS client, on what NIS domain?
17. If this will be an NIS client, what is the server's name?

4 Install FreeBSD

1. Boot FreeBSD from the first CD-ROM. If that fails, make floppy disks and boot from those.

Note that you might need to adjust your BIOS to allow booting from CD-ROM or floppy disk.

Our machine wouldn't boot from CD-ROM so we had to make floppies. See 'floppies/README.TXT' on the first CD-ROM for instructions. You'll need three floppy disks; one for 'boot.flp' and one each for 'kern1.flp' and 'kern2.flp'. Boot with the 'boot.flp' disk and insert the kernel disks when prompted. After the kernel loads, you will be prompted to insert the boot floppy again. At this point, the system will continue loading and eventually bring up the 'Welcome to FreeBSD!' box and begin booting the kernel. Finally, it will bring up the 'sysinstall Main Menu'.

2. */stand/sysinstall Main Menu*: Eventually a menu will appear. Choose "Standard".
3. Partition editor:
 - *Message*: Press Enter to get to the partition editor:
 - *Select Drive(s)*: If you have multiple disks, select the disk to install FreeBSD onto.
 - *FDISK Partition Editor*: This is where you partition your hard disk into up to four slices, where each slice can hold a different operation system. (FreeBSD "slices" are DOS fdisk "partitions"). We typically create two slices, one for FreeBSD and the other for Windows:
 - Verify the drive geometry. If you've have an IDE disk, you're probably using LBA and you'll probably need to adjust the geometry.
 - Next, delete all existing slices.
 - Next, create a 1500MB type 6 DOS slice for Windows.
 - Next, create a type 165 FreeBSD slice using all remaining space.
 - It's OK if a little bit of unused space is left over.
 - Finally, press Q to get out of the partition editor.
 - Back at *Select Drives*: Tab to OK and hit return to move on.
 - Disklabel Editor

- *Message*: Press Enter to get to the FreeBSD Disklabel Editor.
- *FreeBSD Disklabel Editor*: Label a 4.2GB disk something like:

da0s1		1494MB	DOS
da0s2a	/	40MB	UFS Y
da0s2b	swap	256MB	SWAP
da0s2e	/var	64MB	UFS Y
da0s2f	/usr	1200MB	UFS Y
da0s2g	/export	1052MB	UFS Y

'da0s1' is the DOS slice. We'll specify the mount point for this file system (it'll be '/dos') after Windows is installed.

'da0s2a' is the root filesystem. This shouldn't be smaller than 32MB.

'da0s2b' is the swap area. The rule of thumb is to make this at least twice the physical RAM size, with 256MB the minimum.

'da0s2e' is the '/var' filesystem; it shouldn't be smaller than 32MB. You can save a few MB by not having a '/var' filesystem; if you decide not to have one make sure the root filesystem is at least 48MB.

'da0s2f' is the '/usr' filesystem; 1200MB is large enough to hold a generous '/usr/local'. An alternative is to make '/usr/local' its own file system: if you do this, make '/usr/local' at least 800MB and '/usr/local' at least 600MB (yes, this adds up to more than 1200MB).

'da0s2g' is the '/export' filesystem. This is for home directories or anything else that's shared with other machines; this is the part to shrink if disk space is tight!

Use the arrow keys to move up and down, and select appropriate commands from the menu. Create slices with the top line (ex: 'da0') highlighted. Generally speaking, we want to run `newfs` on all slices. Finally, press 'Q' to get out of the editor.

- *Install Boot Manager:* If there is only a FreeBSD partition on the disk, you will not be asked about a boot manager. If FreeBSD is the only operating system installed on the computer, select 'Standard'; otherwise select 'BootMgr'.
4. *Choose Distributions:* Select 'X-Developer', you'll jump to the next window:
 5. *User Confirmation Requested:* Yes, we want to install the FreeBSD ports collection.
 6. *X.org Distribution:* Three submenus are offered here: 'Basic', 'Server', and 'Fonts', along with an 'Exit' choice. We really don't need to do anything here: By default, all basic options are selected, the important server option is selected, and the main fonts are selected. You can select the 'ft1 Type1 scalable fonts' if you want. (I did.) We don't use the font server, but you can if you want to.
 7. *X.org Distribution:* Select 'Exit'.
 8. *Choose Distributions* (2nd time): Select 'Exit'.
 9. *Choose Installation Media:* Select 'CD/DVD'. Insert the first disk, if it's not already loaded.
 10. *Choose a CD/DVD type:* You will get this prompt if you have more than one CD or DVD attached. Choose the drive containing the media.
 11. *Last Chance! Are you SURE you want continue the installation:* Yes, we're sure we want to continue the installation.
If you didn't specify a '/var' filesystem, ignore the *Warning: No /var filesystem* message.
The actual installation begins This'll take a while, perhaps 15 minutes to a half hour. The messages will keep you posted with what's actually going on.
 12. *Congratulations! You now have FreeBSD installed on your system:* Press `[Enter]`.
 13. *Would you like to configure any Ethernet or SLIP/PPP network devices:* Yes, might as well do it now!
 14. *Network interface information required.* You'll see a menu listing the available network interfaces. The first item in the list should be your ethernet card; select that item.

15. *Do you want to try IPv6 configuration of the interface?* Yes
16. *Do you want to try DHCP configuration . . .*: We use fixed IP addresses instead of DHCP so we Just Say No. You should too – DHCP creates more problems than it solves.
17. *Network Configuration*: Fill in the form.
18. *Would you like to bring up the ... interface right now?* Sure! Why not?
19. *Do you want this machine to function as a network gateway?* No, this machine will be an leaf node.
20. *Do you want to configure inetd?* Yes, sort of.
21. *...do you wish to enable inetd?* No. There are no inetd services that we generally need.
22. *Would you like to enable SSH login?* Yes.
23. *Do you want to have anonymous FTP access to this machine?* No, we do not want to allow anonymous ftp connections to this machine.
24. *Do you want to configure this machine as an NFS server?* No, we do not want to configure this machine as an NFS server. We'll configure NFS later.
25. *Do you want to configure this machine as an NFS client?* Yes, we'll configure this machine as an NFS client.
26. *Would you like to customize your system console settings?* No; the defaults work fine.
27. *Would you like to set this machine's time zone now?* Yes, we would like to set this machine's time zone now.
28. *Select local or UTC (Greenwich Mean Time) clock*, depending on how your clock is set. If only FreeBSD is installed on the machine, choose yes; otherwise, choose no.
29. *Time Zone Selector*: Select the appropriate time zone.
30. *Would you like to enable Linux binary compatibility?* Yes. Wait a few minutes as the packages are added.
31. *Does this system have a PS/2, serial, or bus mouse attached?* Yes. (It does, doesn't it?)
32. *Please configure your mouse*: We've entered a kind of loop through which we may return to this menu several times. First, let's see if everything just works. Select 'Enable' . . .
33. *Is the mouse cursor moving?* Answer appropriately. If 'Yes', then we're finished with the mouse configuration.
34. *Please configure your mouse* (2nd time): If you answered 'Yes' on the previous screen, then you should select 'Exit'. Otherwise select 'Type' . . .
35. *Select a protocol type for your mouse*: Select the appropriate protocol, depending on your mouse.
36. *Please configure your mouse* (3rd time): Select "Port".
37. *Select your mouse port from the following menu*: Select the appropriate mouse port.
38. *Please configure your mouse* (4th time): Select "Enable".
39. Try moving the mouse; select "Yes" or "No" depending on whether or not the mouse works.

40. *Please configure your mouse* (5th time): If the mouse worked and you selected “Yes” at the previous window, select “Exit”. Otherwise select a different type or port and try again.
41. *The FreeBSD package collection . . .*: No, we will install the packages we might need later.
42. *Would you like to add any initial user accounts . . .*: No, don’t add additional user accounts.
43. Press Enter and procede to set the system manager’s password.
44. Enter the root password. The system seems to require a combination of letters, symbols, and digits.
45. No, don’t visit the general configuration menu for a chance to set any last options.
46. *sysinstall Main Menu* (2nd time). Select ‘Exit Install’ at the bottom of the screen.
47. Yes, we’re sure we want to exit.
48. You might need to adjust your BIOS (disable booting from CD-ROM) to get the computer to boot from the hard disk.

5 Initial Configuration

When the computer reboots, log in as root. Run 'startx' to start X and provide a graphical display. Open a terminal window by clicking the terminal icon at the bottom of the screen.

1. Verify that '/etc/hosts' and '/etc/resolv.conf' are correct. We had to delete an extraneous line in our '/etc/hosts'.
2. Edit '/etc/ttys'. On the line for ttyv8 change 'off' to 'on'. The next time the computer reboots, it will start up with the graphical interface.
3. Create security banners. Here's how we do it – your organization might require different wording:

```
# mkdir /etc/banners
# cd /etc/banners
# cat > telnetd
```

```
                U.S. GOVERNMENT COMPUTER
        If not authorized to access this system, disconnect now.
```

```
                YOU SHOULD HAVE NO EXPECTATION OF PRIVACY
By continuing, you consent to your keystrokes and data content being monitored.
```

```
^D
```

```
# cp telnetd rshd
# cp telnetd rlogind
# sed 's/^/220-/' telnetd > ftpd
```

4. Edit '/etc/hosts.allow'. Here's an example that grants permission to any computer in *ourcompany.com* and to two outside computers. You'll need to customize this to suit your needs:

```
# cd /etc
# mv hosts.allow hosts.allow-dist
# cat > hosts.allow
ALL: localhost
sshd, sshd fwd-X11: \
    .ourcompany.com buddy.friendly.com, pal.friendly.com: \
    banners /etc/banners: allow
ALL: ALL: banners /etc/banners: deny
^D
#
```

5. If you've have a power saver monitor, add the line

```
Option    "power_saver"
```

in the 'Section "Device"' paragraph of '/etc/XF86Config'.

6. Edit '/usr/X11R6/lib/X11/xdm/Xaccess' to close a potential security hole:

```
# cd /usr/X11R6/lib/X11/xdm
# mv Xaccess Xaccess-dist
# echo '# no-one can run xdm remotely' > Xaccess
#
```

7. Edit `/root/.xsession`. The version that was created when you first started KDE isn't quite right. Edit it to look like:

```
#!/bin/sh
PATH=/sbin:/usr/sbin:/bin:/usr/bin:/usr/local/bin:/usr/X11R6/bin
export PATH
exec /usr/local/bin/startkde
```

8. Create `/root/.bashrc`. It should look something like:

```
PATH=/sbin:/usr/sbin:/bin:/usr/bin:/usr/local/bin:/usr/X11R6/bin
PS1='\w# '
alias lf='/usr/local/bin/gnuls -CF --color=auto'
export LC_CTYPE=C
```

9. Create `/etc/super.tab`.

```
# ln -s /etc/super.tab /usr/local/etc/super.tab
# cat > /etc/super.tab
root          /usr/local/bin/bash u+g=0 \
              info="become root" :wheel
halt          /sbin/halt u+g=0 info="halt the computer" .*
^D
```

10. Reboot the computer so these changes will take effect.

6 User Configuration

We recommend running the automounter and using NIS, even on stand-alone systems, because it makes it so much easier to cluster computers. This discussion assumes other computers have already been set up as NIS and NFS servers

First configure NIS:

1. Edit `/etc/rc.conf`. Add lines like:


```
nisdomainname="my_nis_domain_name"
nis_client_enable="YES"
nis_client_flags="-Smy_nis_domain_name,my_nis_server"
```
2. Run `vipw` to edit the password file; add a new last line:


```
+:::~
```

 (that's nine `~` characters)
3. Edit `/etc/group`. Add a new last line:


```
+:::
```

 (three `~` characters)

Now configure the automounter. We'll assume home directories get mounted as `/home/user` even though the directory is physically either served from a different computer or in `/export/home` on this computer.

1. Create `/etc/amd.home`. Here's an example; you'll need to customize this for your cluster:


```
/defaults      type:=link;sublink:=${key}
mickey         fs:=/export/home
tarzan         fs:=/host/server.jungle.com/x
jane           fs:=/host/server.jungle.com/x
*              fs:=/host/server.ourcompany.com/export/home
```
2. Edit `/etc/rc.conf`. Add the following lines:


```
amd_enable="YES"
amd_flags="-l syslog /host /etc/amd.map /home /etc/amd.home"
```

Reboot the computer and verify that users can log in.

7 Install FreeBSD Packages

7.1 Packages

1. Insert the first CD-ROM:
2. Install libcompat22:


```
# mount /cdrom
# cd /cdrom/compat22
# ./install.sh
# cd /
# umount /cdrom
#
```
3. Insert the third CD-ROM, run “/stand/sysinstall”, choose “Configure”, then “Packages”, and then “CDROM”.
4. *Package Selection*: Select All, then pick the following:

Install these, then back out of ‘sysinstall’ until you get back to the shell prompt. Remove the first disk, insert the third disk, and run ‘/stand/sysinstall’ again. Choose ‘Configure’, then ‘Packages’, and then ‘CDROM’. Choose ‘All’ and select the following:

 - acroread-4.05
 - gimp-1.1.17
 - gmake-3.78.1
 - gv-3.5.8
 - teTeX-1.0.7
 - xemacs-mule-sumo-21.1
5. *FreeBSD Configuration Menu*: (The third time here). Insert the fourth CD-ROM and select “Packages”.
6. *Package Selection*: Select All, then pick the following:

Install these, then back out of ‘sysinstall’ until you get back to the shell prompt. Remove the first disk, insert the third disk, and run ‘/stand/sysinstall’ again. Choose ‘Configure’, then ‘Packages’, and then ‘CDROM’. Choose ‘All’ and select the following:

 - enlightenment-0.16.3

7.2 Ports

A few more packages are needed to run ITOS:

1. Install jdk-1.1.8

If you’ve already have jdk1.1.8_ELF.V1999-11-9.tar.gz on another machine, copy it into /usr/ports/distfiles. If you don’t have it, don’t worry - ‘make’ will fetch it for you!

```
# cd /usr/ports/java/jdk
# make install
# ln -s /usr/local/jdk1.1.8 /usr/local/jdk
```

2. Install jikes-1.12

If you've already have jikes-1.12 on another machine copy it into /usr/ports/distfiles. If you don't have it, don't worry - 'make' will fetch it for you!

```
# cd /usr/ports/java/jikes
# make install
```

3. Install dvips. *If you've already have dvips576.tar.gz on another machine, copy it into /usr/ports/distfiles. #cd /usr/ports/print/dvips #make install press Enter at the prompts to use defaults*

4. Install dvipdfm. First get the port from the FreeBSD web site, then untar it into a temporary work directory. It will untar into something like 'pub/FreeBSD/branches/-current/ports/print/dvipdfm'; move this directory to '/usr/ports/print' to get a '/usr/ports/print/dvipdfm' directory. Then:

If you've already have dvipdfm-0.13.7b.tar.gz on another machine, copy it into /usr/ports/distfiles.

```
# cd /usr/ports/print/dvipdfm
# make install
```

5. Install texinfo and texi2www Our documentation is written in an enhanced version of GNU texinfo. The texi2www script converts texinfo documentation into html. To install it, get <ftp://sunland.gsfc.nasa.gov/pub/tarfiles/texinfo-3.12t+texi2www.tgz> and:

```
# cd $WORKDIR;
# tar zxvf /usr/ports/distfiles/texinfo-3.12t+texi2www.tgz
# cd texinfo-3.12t+texi2www
# ./configure && make && make install
# make TEXMF=/usr/local/share/texmf install-tex
Edit /usr/local/bin/texi2www; change the first line to run /usr/bin/perl
instead of /usr/local/bin/perl.
```

6. Install Open Motif 2.1 which is commercially available, follow the instructions with your distribution. Note that Mofit 2.0 is unacceptable. Also note that lesstif is no longer required.

7. Install jlex You should have already installed 'jlex-1.2.3' from packages on the first CD. Complete the installation by:

```
# ln -s /usr/local/jdk/jlex /usr/local/JLex
```

8. Install jcchart220.jar. This is from the JClass Chart product from the KL Group at <http://www.klg.com/>. In addition, you will need jcbwt220.jar and jcchartItos.jar.

[Our license allows us to distribute 'jcchart220.jar' with ITOS releases for use by ITOS end-users only.]

```
# mkdir /usr/local/javalibs
# cp jcchart220.jar /usr/local/javalibs
# cp jcbwt220.jar /usr/local/javalibs
# cp jcchartItos.jar /usr/local/javalibs
```

9. Install mved, which can be obtained from <http://sunland.gsfc.nasa.gov/pub/tarfiles/mved>. Install this shell script via:

```
# cp /usr/ports/distfiles/mved /usr/local/bin
# chmod a+x /usr/local/bin/mved
```

8 Configure Apache

```
# cd /usr/local/etc/apache
# mv default.conf httpd.conf
```

Edit `/usr/local/etc/apache/httpd.conf`:

1. Change the “ServerAdmin” line. You might want to set up a ‘www’ alias.
2. Uncomment the “<Directory /home/*/public_html>” block.
3. Change the “DirectoryIndex” line to:

```
DirectoryIndex Welcome.cgi Welcome.shtml Welcome.html Top.html index.html
```

4. Uncomment the “AddHandler cgi-script .cgi” line.
5. Uncomment the “AddType text/html .shtml” and “AddHandler server-parsed .shtml” lines.

The “DocumentRoot” defaults to `/usr/local/www/data`. We make this a symbolic link to the actual DocumentRoot directory, which in our case is `/export/DocumentRoot`:

```
# ls /usr/local/www/data
ls: /usr/local/www/data: No such file or directory
# ln -s /export/DocumentRoot /usr/local/www/data
#
```

FreeBSD includes several ‘.html’ documents that you might want to serve. You can make these available by creating some symbolic links and adding some href’s in your html documents. The links include:

```
# ln -s /usr/local/share/doc/apache/manual apache
# ln -s /usr/share/doc/faq FreeBSD-FAQ
# ln -s /usr/share/doc/handbook FreeBSD-handbook
# ln -s /usr/local/share/doc/HTML/default KDE
# ln -s /usr/local/share/doc/samba samba
#
```

The href’s include:

```
<A HREF="/apache/">Apache WWW server documentation</A>
...
<A HREF="/FreeBSD-FAQ/">FreeBSD FAQ</A>
...
<A HREF="/FreeBSD-handbook/">FreeBSD handbook</A>
...
<A HREF="/KDE/">KDE documentation</A>
...
<A HREF="/samba/htdocs/samba.7.html">Samba man pages</A>
...
```


Appendix A Miscellaneous Tips and Tricks

A.1 Packages on the first CD.

These are the packages we've looked at.

- CaribbeanStud-1.0 *** A poker variant.
- ImageMagick-4.2.9 ****
- aXe-6.1.2 **** simple text editor. Similar to asedit-1.3.2
- *add-1.0 – ASCII calculator; not recommended.*
- affenspiel-1.0 ** some kind of sliding-block puzzle.
- *aish-1.13 – Ish/uuencode/Base64 converter. Not sure when we'd use it.*
- an-0.93 ** anagram generator. Cute.
- apache-1.3.9 ***** WWW server.
- *ascpu-1.6 – CPU statistics monitor. There's got to be better!*
- asedit-1.3.2 **** simple text editor.
- *ashe-1.1.2 – (not recommended) – The 'xhtml' HTML editor; bluefish-0.3.4 is better.*
- *asmon-0.60 – CPU monitor. We've seen better.*
- autoconf-2.13 ***** (required) GNU autoconf.
- automake-1.4 ***** (required) GNU automake.
- *awele-1.0 – (not recommended) african board game [awelewish]. Couldn't make it work*
- bash-2.03 ***** (required) GNU's Bourne again shell.
- battleball-2.0 *** multi-player soccer game. Might be good with several players.
- beav-1.40.13 **** Binary file editor; let's you edit object files, etc. Reminds me of emacs . . .
- *bgrot-1.20 – handles X background. Not much to it; use xv instead!*
- blackjack-1.1 *** blackjack game; good graphics.
- blast-1.0 * blast holes through windows. Cute but irritating.
- blockade-1.00 *** push-the-blocks puzzle.
- *blue-2.3 – (not recommended) ascii (not X) card game.*
- bluefish-0.3.4 **** HTML editor; more powerful than the 'xhtml' in ashe-1.1.2.
- bogged-1.0.0 *** word game.
- bonnie-1.0 ** performance test filesystem I/O
- *bs-2.1 – (not recommended) ascii battleship game.*
- btoa-5.2.1 * encode/decode binary. Seems to work OK, but we're not sure when we'd use it.
- bytebench-3.1 ** BYTE magazine benchmark suite.
- cal-3.5 ** looks like the normal cal unless it finds a configuration file.
- calc-2.9.3 **** ASCII calculator. Easier to use than bc.

- camediaplay-19991202 ***** Digital camera download tool for Epson/Sanyo/Olympus/Agfa. If you've got one of these camerase . . .
- cdrecord-1.8.a33 ***** Utilities for burning CD-ROM images. If you've got a CD burner . . .
- *colorls-2.2.7 -gnuls-4.0 is better.*
- cops-1.04 ***** Security checker.
- dclock-pl4 ***** digital clock.
- docbook-xml-3.1.7 ***** docbook. Not yet required for ITOS . . .
- dontspace-1.2 *** solitaire card game
- *dopewars-1.4.6 - ASCII game.*
- *drm-1.0 - ASCII tetris game*
- emacs-20.4 ***** GNU emacs. (Later we'll install xemacs).
- *emiclock-2.0.2 - analog clock with little girl? figure.*
- empire-1.1 *** war game
- *emu-1.3.1 - terminal emulator. Nice, but when would we use it.*
- enlightenment-0.16.3 ***** (recommended) A window manager, popular with GNOME.
- enlightenment-conf-0.15 ***** (recommended) configures enlightenment.
- *eyeclock-1.03 - eyes follow mouse clock. Cute, but ...*
- *flying-6.20 - (not recommended) pool game; we couldn't make it work.*
- fvwm-2.2.2 *** A window manager for X that looks like mwm.
- *galaxis-1.1 - macintosh game. Non-graphical interface.*
- gemdropx-0.4 ** one-player game; a little bit like tetris.
- getline-3.9 ***** Required for ITOS development.
- ghostscript-5.50 ***** Postscript interpreter
- ghostview-1.5 ***** Postscript viewer.
- gimp-1.1.11 ***** Kinda like photoshop.
- gmake-3.77 ***** GNU make; needed for ITOS development.
- gnome-1.0.53 ***** GNOME integrated X11 desktop.
- gnuchess-4.0.80 *** chess game; be sure to also get xboard-4.0.3.
- gnuls-4.0 ***** GNU ls (better than colorls).
- golddig-2.0 *** game, a bit like lode runner.
- gperiodic-1.2.1 ** periodic table of elements.
- *gracer-0.1.3 - 3d motor sports simulator. Looks nice, but does it play?*
- gru-8087 ** hypnotic moving image
- gv-3.5.8 ***** a PostScript and PDF previewer.
- healthd-0.2 ** monitor motherboard
- hexcalc-1.11 ***** multi-radix calculator.
- *hexedit-1.1.0 - hex editor*

- ishido-1.1 ** tile placement game, similar to xcogitate
- *jetpack-1.0 – arcade games; didn't install right*
- jlex-1.2.3 ***** Lexical analyzer generator in Java.
- *klondike-1.9 – (not recommended) solitaire card game; get sol-1.0.6 instead.*
- krubic-1.06 ** rubik's cube game.
- kworldwatch-0.6 **** revolving world map. A very nice clock.
- lavaps-1.8 * lava lamp of running apps
- less-340 ***** Less is more???
- libtool-1.3.3 ***** GNU libtool. Required for ITOS development.
- linux-netscape-communicator-4.7 ***** netscape. This will appear to fail since compat22 isn't installed – don't worry, we'll install that package later.
- lupe-0.08 * magnifying glass. xlupe-1.0 is better.
- *mirrormagic-1.3 – arcade game. Couldn't make work!*
- *miscom-1.0 – missile command game clone*
- mkisofs-1.12b5 ***** Make CD-ROM images.
- mouseclock-1.0 ** background cursor shows time.
- *mpeg2play-1.1b – mpg player; mpeg-play-2.4 works better for us*
- mpeg-play-2.4 **** .mpg player.
- mtools-3.9.6 **** mdir, mcopy, mtype, etc. Makes dealing with DOS floppy disks easy.
- netpbm-8.0 **** Image conversion tools.
- netris-0.4 *** tetris
- netscape-remote-1.0 ***** pass commands to running netscape.
- nologin-1.0 ** log unauthorized login attempts.
- olvwm-4.2 ***** Olvwm window manager.
- oneko-1.2 *** cat chases mouse.
- *oonsoo-1.1 – solitaire card game. Couldn't make work!*
- pdksh-5.2.14 ***** A ksh clone.
- sattrack-3.1.6 *** show satellite orbits.
- *sl-3.03 – steam locomotive. Cute first time; then irritating*
- socket-1.1 **** Telnet-like utility for testing TCP-IP sockets.
- sol-1.0.6 *** One of the better Klondike games.
- spider-1.1 *** Solitaire card game.
- *stars-1.0 – star field demo? Couldn't make work!*
- *sunclock-1.4 – show illuminated earth. Use kworldwatch instead.*
- super-3.12.1 ***** Allows ordinary users to do things as root.
- swisswatch-0.06 **** clock
- sxsame-3.02 *** tile-removing puzzle
- tcsh-6.09.00 ***** tcsh, a better csh.

- *tksol-1.0* – *solitaire game. Nice, but sol is better.*
- *uudeview-0.5.13* ***** Better than uudecode.
- *wmMoonClock-1.26* – *doesn't work; what is windowmaker?*
- *workman-1.3a* ***** CD (music) player.
- *x3arth-1.1* ** updates root window with current satellite image
- *x48-0.4.0* – *HP calculator. Doesn't work*
- *xanim-2.80.1* *** Plays '.avi' and '.mov' files.
- *xantfarm-1.16* * ant farm simulation in root window
- *xasteroids-5.0* – *asteroids game.*
- *xbl-1.0j* ** blockout game; kind of a 3-d tetris.
- *xblackjack-2.2* – *blackjack game; others are better*
- *xblood-1.0* * make root window bloody.
- *xbloody-1.00* * knife on X
- *xboard-4.0.3* *** GNU chess game.
- *xboing-2.4* *** arcade game
- *xbomb-2.1* ** minesweeper
- *xbomber-0.8* ** based on nintendo game
- *xcdplayer-2.2* ** CD player.
- *xchomp-pl1* ** packman-like game
- *xco-1.3* – *display X11 color names – doesn't run at 16bit depth*
- *xcogitate-1.02* – logic game, similar to ishido.
- *xcoloredit-1.2* – *pick colors – doesn't run at 16bit depth*
- *xcolors-1.3* – *display all colors – doesn't fit on screen*
- *xcolorsel-1.1a* * Displays colors by name.
- *xcpustate-2.5* * show cpu load and status
- *xcubes-5.4.4* – cube puzzle
- *xdaliclock-2.14* ***** one of the better clocks
- *xdeblock-1.0* – *action game – doesn't work*
- *xdemineur-2.1.1* *** minesweeper game.
- *xdevview-0.5.13* *** uu/xx/base64/binhex de-/encoding
- *xdgagrab-0.3* – *capture screen image. Doesn't seem to work.*
- *xdino-5.4.4* – game
- *xdvi-pl20* – Displays '.dvi' files.
- *xearth-1.0* ***** set root image
- *xemeraldia-0.31* – game of breaking blocks, similar to tetris.
- *xengine-1.0.1* * reciprocating engine.
- *xenon-0.6.6* – *text editor, didn't work*
- *xevil-1.5* – kill everything game

- *xfedor-1.0* – *bitmap editor, didn't draw right*
- *xfig-3.2.2* – drawing program
- *xfishtank-2.2* ** fish tank background
- *xflame-1.1.1* * animated flame. Too small, no documentation.
- *xgalaga-2.0* – galaga game
- *xgas-1.0* * simulate ideal gas. One star.
- *xgrab-2.41* – image grabber
- *xhexagons-5.4.4* – puzzle
- *xisola-1.0* – board game
- *xjewel-1.6* – dropping jewels game
- *xjig-2.4* – *jigsaw puzzle game; didn't work*
- *xjumpjump* – logical game
- *xkobo-1.11* – shoot 'em game
- *xkoules-1.4* *** arcade game, very good
- *xlaby-2.0.1* – labyrinth game
- *xlife-3.0* – Conway's game of life
- *xlines-1.0* – game with 2-d grid containing balls. No on-line help or man page.
- *xlockmore-4.15* – screen locker
- *xlupe-1.0* ***** magnifying glass.
- *xmandel-1.0* – mandelbrot
- *xmangekyou-2.0* – kaleidoscope.
- *xmascot-2.5p2* * moving mascot. Cute but pretty much useless.
- *xmastermind-0.1* – mastermind game
- *xmball-5.4.4* – masterball puzzle
- *xmcd-2.5* – CD player
- *xmj-1.0* – mahjongg
- *xoids-1.5* – asteroids game
- *xpacman-1.0* – pac man game
- *xpaint-2.5.6* – paint program
- *xpat2-1.06* – solitaire game
- *xpipeman-1.0* – pipe game.
- *xripple-1.0* * makes bottom of screen ripple
- *xroach-4.4* – roach hide under windows
- *xrubik-5.4.4* – *rubik's cube; krubic-1.06 is better.*
- *xscavenger-1.3.5* – a Lode Runner clone
- *xscrabble-1.0* – game
- *xskyroot-920538* – *draws sky on root window. Lame.*
- *xsol-2.1.1* – *klondike; others are better*

- xsysinfo-1.4a – bar charts showing system load.
- xsysstats-1.34 – system info
- xtestpicture-1.2 – full-screen test image, for adjusting monitor.
- xv-3.10a ***** Image viewer.

A.2 Rebuilding the Kernel

Although the default kernel works quite well and is able to run ITOS, you might want to build a custom kernel. Here's what we had to do in order to run Star Office:

1. Create '/sys/i386/conf/MYNAME', where *MYNAME* is the name of this computer, in upper case letters:

```
# cd /sys/i386/conf
# cp GENERIC MYNAME
#
```

2. Edit 'MYNAME'; add the following three lines after the "options SYSVSEM" line:

```
options          "P1003_1B"
options          "_KPOSIX_PRIORITY_SCHEDULING"
options          "_KPOSIX_VERSION=199309L"
```

3. There's lots more changes you could make. Read 'LINT' and be very careful ...
4. Configure, make, and install the new kernel:

```
# pwd
/sys/i386/conf
# config MYNAME
# cd ../../compile/MYNAME
# make depend && make && make install
#
```

5. Reboot the computer to run the new kernel

A.3 ppp

This recipe configures PPP to dial on demand and perform packet aliasing, and is extremely useful for connecting a local network to the internet.

On the computer that will act as the gateway between your local network and the internet:

1. Give the computer's ethernet interface a non-routing IP address, for example 192.168.0.1.
2. Edit '/etc/rc.conf'. Add the following line:

```
gateway_enable="YES"
```

3. Edit '/etc/ppp/ppp.conf'. Add a section like:

```
my_isp_name:
set phone 3015551234
set authname ralph07
set authkey z6Ynn42
```

```
set timeout 600
set ifaddr 10.0.0.1/0 10.0.0.2/0 255.255.255.0 0.0.0.0
add default HISADDR
```

4. Edit ‘/etc/rc.local’. Add a section like:

```
[ -x /usr/sbin/ppp -a -f /etc/ppp/ppp.conf ] \
&& /usr/sbin/ppp -auto -alias my_isp_name
```

On other computers on your local network:

1. Give the computer’s ethernet interface a non-routing IP address, for example something in the range 192.168.0.0 through 192.168.255.255. Of course, make sure each computer on your private network has a unique address.
2. Edit ‘/etc/rc.conf’. Add the following line:

```
defaultrouter="192.168.0.1"
```

A.4 burning CDs

We’ve made CD-ROMs using Yamaha CRW4260 and Yamaha 4416S SCSI burners. We haven’t tried IDE burners but have heard numerous anecdotes that they don’t work well. These recipes assume a SCSI burner:

A.4.1 Data CDs

There are several ways to create a data CD; here’s one that we recommend. Note that it assumes you’ve got a lot of disk space – at least twice what you plan to put on the CD – available. Since CDs can hold about 650mb, we recommend you have at least 1.3GB available.

1. Create a directory tree containing everything you want to put on the CD-ROM. Run “du -sk .” in this directory to see how big it is; the upper limit is somewhere between 600000 and 700000.

If you’ve made CDs before you might have run into filename and directory depth restrictions. You shouldn’t need to do anything special with this recipe since it handles all normal Unix filenames and directory trees.

2. Create the ISO9660 file system image. For the sake of argument, let’s assume ‘/export/cd/workdir’ is the directory containing everything you want to put on the CD-ROM. Use *mkisofs* to create an ISO9660 image named ‘/export/cd/iso9660.img’:

```
# cd /export/cd
/export/cd
# mkisofs -d -D -R -o iso9660.img workdir
it's normal to get a bunch of messages.
```

Note that you can do this on any computer, not just the computer with the CD burner.

3. Burn the CD-ROM. Now you have to be on the computer with the CD burner. If you created the ISO9660 file system image on a different computer, you’ll need to copy it to this computer’s disk. We can’t guarantee things will work if the ISO9660 image is NFS mounted from a different computer!

Assuming the ISO9660 is in `/export/cd/iso9660.img` and the CD burner is at SCSI target 2 use the following `cdrecord` command:

```
# cdrecord -v -dev=2,0 -data /export/cd/iso9660.img
    the '2' in '-dev=2,0' is the SCSI target of the CD burner
```

Burning the CD will take quite a while.

A.4.2 Music CDs

`cdrecord` also records music CDs. Use `cdda2wav` to extract tracks from a music CD.

A.5 samba

A.6 sound cards

Assuming your sound card is supported, just copy the 'Audio drivers' section from LINT into the machine's configuration file and rebuild the kernel. See See Section A.2 [rebuilding the kernel], page 20.

A.7 NIS server

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